Equilibrium Questions

Consider the following chemical reaction:

$$H_2\,(g) + I_2\,(g) \rightleftharpoons 2HI\,(g)$$

At equilibrium in a particular experiment, the concentrations of H_2, I_2, and HI were 0.15 M, 0.033 M, and 0.55 M, respectively.

i) Write the expression for the equilibrium constant.

ii) What is value of the equilibrium constant?

The value of K_{eq} for the equilibrium

$$H_2\,(g) + I_2\,(g) \rightleftharpoons 2\,HI\,(g)$$

is 794 at 25 °C. What is the value of K_{eq} for the equilibrium below?

$$\tfrac{1}{2}H_2\,(g) + \tfrac{1}{2}\,I_2\,(g) \rightleftharpoons HI\,(g)$$

A reaction vessel is charged with hydrogen iodide, which partially decomposes to molecular hydrogen and iodine:

$$2HI\,(g) \rightleftharpoons H_2(g) + I_2(g)$$

When the system comes to equilibrium at 425 °C, $P_{HI} = 0.708$ atm, and $P_{H2} = P_{I2} = 0.0960$ atm.. What is the value of K_p?

Acetic acid is a weak acid that dissociates into the acetate ion and a proton in aqueous solution:

$$HC_2H_3O_2\,(aq) \rightleftharpoons C_2H_3O_2^-\,(aq) + H^+\,(aq)$$

At equilibrium at 25 °C a 0.100 M solution of acetic acid has the following concentrations: $[HC_2H_3O_2] = 0.0990$ M , $[C_2H_3O_2^-] = 1.33 \times 10^{-3}$ M and $[H^+] = 1.33 \times 10^{-3}$ M . The equilibrium constant, K_{eq}, for the ionization of acetic acid at 25 °C is _____.

Dinitrogen tetraoxide partially decomposes according to the following equilibrium:

$$N_2O_4\,(g) \rightleftharpoons 2NO_2\,(g)$$

A 1.00-L flask is charged with 0.400 mol of N_2O_4. At equilibrium at 373 K, 0.0055 mol of N_2O_4 remains. What is the K_{eq} for this reaction?

At 22 °C, $K_p = 0.070$ for the equilibrium:

$$NH_4HS\,(s) \rightleftharpoons NH_3\,(g) + H_2S\,(g)$$

A sample of solid NH_4HS is placed in a closed vessel and allowed to equilibrate. Calculate the equilibrium partial pressure (atm) of ammonia, assuming that some solid NH_4HS remains.

The equilibrium constant (K_p) for the interconversion of PCl_5 and PCl_3 is 0.0121:

$$PCl_5\,(g) \rightleftharpoons PCl_3\,(g) + Cl_2\,(g)$$

A vessel is charged with PCl_5, giving an initial pressure of 0.123 atm. At equilibrium, the partial pressure of PCl_3 is _____ atm.

For the reaction below, $K_p = 0.0198$ at 721 K.

$$2HI\,(g) \rightleftharpoons H_2\,(g) + I_2\,(g)$$

In a particular experiment, the partial pressures of H_2 and I_2 at equilibrium are 0.710 and 0.888 atm, respectively. The partial pressure of HI is _____ atm.